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GEOCHEMISTRY.—*Note on the inorganic constituents of two small crustaceans.*[1] F. W. CLARKE and B. SALKOVER, Geological Survey.

It is well known that very small crustaceans, such as the copepods, form an important part of the marine plankton, and that they serve as food for larger animals, like the fishes and cetaceans. The larger crustaceans all have shells or skeletons which contain much calcium phosphate, and a comparison of the two classes seemed to be a matter of some interest. Accordingly two samples, each made up of hundreds of individuals, were obtained from the U. S. National Museum and subjected to partial analysis. They were as follows:

1. *Temora longicornis* (O. F. Müller), from the coast of New England. Weight of dried sample, 0.6105 gram. A copepod.

2. *Thysanoessa inermis* (Kroyer), from Balena, Newfoundland. Weight of dried sample, 1.5973 grams. A small shrimp.

As the amount of material was insufficient for a thorough analysis, only three determinations were made on each sample. They were: loss on ignition, mainly organic matter and water; phosphoric oxide; and residue insoluble in acid. The phosphoric oxide, P_2O_5, was recalculated into the form of tricalcic phosphate, $Ca_3P_2O_8$, and with that adjustment the analyses assume the following shape.

[1] Published by permission of the Director of the U. S. Geological Survey.

	1	2
Loss on ignition	96.05	92.08
Tricalcic phosphate	2.77	7.68
Insoluble	0.92	0.22
	99.74	99.98

These analyses show that the inorganic matter of these minute creatures consists almost entirely of calcium phosphate, although more refined analyses on larger quantities of material would doubtless show small percentages of other things. So far, however, it seems that these very small organisms effect what is perhaps a primary concentration of the traces of phosphorus that exist in sea water, and so, as food for the larger animals, they furnish the material from which the skeletons of marine vertebrates are built. It is a familiar fact that vertebrate skeletons consist largely, although not exclusively, of calcium phosphate.

GEOLOGY.—*Correlation of the deposits of Jackson and Vicksburg ages in Mississippi and Alabama.*[1] CHARLES WYTHE COOKE, Geological Survey.

The deposits of Jackson and Vicksburg ages in Alabama are usually referred to a single formation, the "St. Stephens limestone," although many writers have pointed out differences between the upper and the lower parts. Smith and Johnson[2] divided the "St. Stephens limestone" into three members which correspond roughly to the major divisions adopted in this paper, and incomplete studies in western Alabama led Vaughan[3] to the opinion that more detailed investigation would differentiate the Jackson from the Vicksburg.

This paper summarizes the results of field studies on the stratigraphy and paleontology of the "St. Stephens limestone"

[1] Published by permission of the directors of the U. S. Geological Survey and the Mississippi Geological Survey.

[2] SMITH, E. A., and JOHNSON, L. C., U. S. Geol. Survey Bull. 43: 20. 1887.

[3] VAUGHAN, T. W., U. S. Geol. Survey Prof. Paper 71: 738, 739. 1912.

made in 1913 and 1914 for the U. S. Geological Survey. It contains also a synopsis of a manuscript report on the Jackson formation and the Vicksburg group in Mississippi prepared in partial fulfilment of an agreement between the U. S. Geological Survey and the Mississippi Geological Survey for a coöperative investigation of the physiography, stratigraphy, and ground waters of Mississippi. The correlations and names adopted are shown in Table 1.

TABLE 1

Correlation of the Jackson and Vicksburg deposits in Mississippi and Alabama

<table>
<tr><th>Age</th><th colspan="3">Mississippi</th><th>Alabama</th></tr>
<tr><td rowspan="4">Oligocene</td><td rowspan="4">Vicksburg group</td><td colspan="3">BYRAM CALCAREOUS MARL</td><td rowspan="4">MARIANNA LIMESTONE</td></tr>
<tr><td rowspan="3">MARIANNA LIMESTONE</td><td colspan="2">Glendon limestone member</td></tr>
<tr><td>Mint Spring calcareous marl member</td><td>"Chimney Rock" facies</td></tr>
<tr><td>FOREST HILL SAND</td><td>RED BLUFF CLAY</td></tr>
<tr><td rowspan="2">Eocene</td><td rowspan="2">JACKSON FORMATION</td><td colspan="2">Yazoo clay member</td><td rowspan="2">OCALA LIMESTONE</td></tr>
<tr><td colspan="2">Moodys calcareous marl member</td></tr>
</table>

JACKSON FORMATION

In Mississippi, Lowe[4] has divided the Jackson deposits into formations described by him as Yazoo clay marl, Moodys Branch green marl, and Madison sands. The last of these, which was doubtfully placed in the Jackson by Lowe, is here referred to the Vicksburg group and will be discussed later. The other two intergrade so much that it seems advisable to consider them members of a single formation rather than as constituting independent formations. In the succeeding discussion they are

[4] LOWE, E. N., Mississippi, its Geology, Geography, Soils, and Mineral Resources. Mississippi Geol. Survey Bull. 12: 78–84. 1915.

called the Yazoo clay member and the Moodys calcareous marl member of the Jackson formation, of which the Yazoo clay is the upper and the Moodys marl the lower member. Although the typical exposures of the Yazoo clay are in the bluff of Yazoo River at Yazoo City, Mississippi, both of these members crop out in the vicinity of Jackson, Mississippi, where their relative stratigraphic position is evident. The Moodys calcareous marl member is named from Moodys Branch, a small tributary of Pearl River within the city limits of Jackson.

The Jackson formation in Mississippi is composed chiefly of more or less calcareous clay and less prominent sand and marl beds. At Jackson and Garland's Creek, the Moodys marl member contains at the base a bed of shells inclosed in quartz sand and glauconite and merges below into lignitic clay and sand supposed to be of upper Claiborne age (Yegua formation). Toward the top, the Moodys member is less sandy and much more calcareous and contains thin beds of indurated marl or impure limestone. Although these ledges of marlstone are discontinuous, the zone in which they are found extends from Yazoo River to western Alabama, where it has been called the "*Zeuglodon* bed."[1] The Yazoo clay member consists almost entirely of calcareous, very plastic clay of various colors, but in most places blue or green when wet but gray when dry.

The thickness of the Jackson formation varies considerably from place to place. In general, the Moodys marl thins from east to west and the Yazoo clay thickens rapidly in the same direction. In central and western Mississippi, its thickness does not much exceed 35 or 40 feet, but farther east, owing to the interpolation of beds of sand and clay, it is materially greater. In Alabama, a few miles east of the Mississippi state line, the equivalents of the Moodys marl are more than 90 feet thick. The Yazoo clay member is thickest in the extreme western part of Mississippi, where well borings south of Vicksburg indicate a thickness of nearly 600 feet, and thins rapidly toward the east.

[1] SCHUCHERT, CHARLES, U. S. Nat. Mus. Proc. **23**: 329. 1900; COOKE, C. W., U. S. Geol. Survey Prof. Paper **95**: 116. 1915.

In the vicinity of Jackson the Yazoo clay probably does not exceed 200 feet in thickness; at Shubuta it is reduced to 70 feet; and in western Alabama it becomes of negligible thickness and merges with the underlying member. The aggregate thickness of the Jackson formation appears to be about 600 feet in western Mississippi, about 230 feet at Jackson, and about 150 feet at Shubuta.

In Choctaw and Washington counties, Alabama, and in the adjacent part of Mississippi, the stratigraphy of the Jackson is somewhat different. The formation divides naturally into five lithologic units, as follows:

Subdivisions of the Jackson formation in western Alabama and eastern Mississippi

	feet
5. Yazoo clay member: Greenish gray calcareous clay with white calcareous concretions	8–50
4. "*Zeuglodon* bed.": Buff argillaceous marl with hard ledges. *Terebratulina lachryma, Aturia alabamensis,*[6] *Ostrea trigonalis, O. falco, Pecten perplanus, Schizaster armiger, Basilosaurus cetoides*	8–15
3. Fine yellow sand with indurated lumps in the upper part. Well exposed at Cocoa, Alabama	11–70
2. Greenish yellow, calcareous, very plastic clay	30–50
1. Hard yellow or brown impure limestone or indurated marl with *Periarchus lyelli* or *P. pileus-sinensis* and *Pecten perplanus*	0–15

Division 1 of this generalized section appears to be largely identical with the "*Scutella* bed" which Smith[7] doubtfully referred to the "St. Stephens limestone." In a section at Willow Branch[8] I drew the Claiborne-Jackson line at the top of an attenuated remnant of this bed, and Hopkins[9] accepted this correlation. My reasons for referring this bed to the Jackson are the following: (1) *Pecten perplanus* and *Periarchus pileus-sinensis*, species elsewhere restricted to deposits of Jackson age,

[6] I am probably to blame for the slip of the pen which caused Hopkins to list *Belosepia ungula* instead of *Aturia alabamensis* in the "*Zeuglodon* bed" (U. S. Geological Survey Bull. 661-H: 296. 1917). Fortunately, I attached the correct name to the specimen figured by him on plate 27.

[7] SMITH, E. A., JOHNSON, L. C., and LANGDON, D. W., Report on the Geology of the Coastal Plain of Alabama. Alabama Geol. Survey, p. 111. 1894.

[8] COOKE, C. W., *The age of the Ocala limestone.* U. S. Geol. Survey Prof. Paper 95: 115. 1915.

[9] HOPKINS, O. B., *Oil and gas possibilities of the Hatchetigbee anticline, Alabama.* U. S. Geol. Survey Bull. 661-H: 294, 297. 1917.

have been found in it at some places; (2) it is the first calcareous bed of a series dominantly calcareous and succeeds noncalcareous sands; (3) at Willow Branch and one or two other places there is evidence strongly suggestive of unconformity between this bed and the underlying Gosport sand.

The other four divisions are the same as those described by Hopkins[10] and need no further comment here. Sections illustrating them are given by Hopkins and Cooke in the papers cited.

The Jackson formation contains a large marine fauna. From Jackson, Mississippi, I have listed 200 species of mollusks and Vaughan has identified 12 species of corals; of these, about 49 are survivals from the Claiborne and about 15 are supposed to have lived also in Vicksburg time. Canu and Bassler[11] list 67 species of Bryozoa from Jackson, of which 15 are known from the Claiborne group and 9 from the Vicksburg. The commonest and most significant vertebrate is *Basilosaurus cetoides*.

OCALA LIMESTONE

East of Tombigbee River a rather abrupt change is noticeable in the stratigraphy of the deposits of Jackson age. The beds become progressively more calcareous, lose their individuality, and assume more and more the lithologic and faunal aspects of the Ocala limestone of Florida. In some places a dual division of these beds may be distinguished, but it is not everywhere possible to draw a sharp line of demarkation between the upper and the lower members. The lower part consists chiefly of very argillaceous and somewhat glauconitic limestone, and on Sepulga River the approximate position of the yellow sand at Cocoa (division 3 of the generalized section) is occupied by calcareous sandstone. The upper part, corresponding to the "*Zeuglodon* bed" and the Yazoo clay, consists of soft, cream-colored, amorphous limestone which closely resembles the "chimney rock" of the overlying Marianna limestone.

[10] Op. cit., 296.

[11] CANU, FERDINAND, and BASSLER, R. S., *Manuscript list of Eocene and Oligocene Cheilostome Bryozoa.*

As the upper Eocene limestone of southeastern Alabama is continuous with the Ocala limestone of Florida and southwestern Georgia and does not differ materially from it in lithology or in fossils, the name Ocala limestone is extended to all of the deposits of Jackson age in that part of the state, but future more detailed field work may show the propriety of restricting the name Ocala to the upper part of the formation. Just where the boundary between the Ocala limestone and the Jackson formation should be drawn is a matter of expediency, for the transition area, although narrow, is without definite natural limits. Either the Tombigbee River or the 88th meridian might conveniently be selected.

VICKSBURG GROUP

In Mississippi the Vicksburg group falls naturally into three divisions, the upper, middle, and lower Vicksburg, which differ from one another in both lithology and fossils. The first of these, which corresponds to the "Higher Vicksburgian" of Meyer[12] and to the "Upper Vicksburgian" of Casey,[13] is herein named Byram calcareous marl; for the second, which is approximately equivalent to the "Middle and Lower Vicksburgian" of Meyer and to the "Lower Vicksburgian" of Casey, the name Marianna limestone, already in use in Florida, is available; the third includes two facies, a shallow-water or nonmarine facies in western Mississippi, which will be called the Forest Hill sand, and a marine facies in eastern Mississippi and western Alabama known as the Red Bluff clay. In the middle division, or Marianna, two subdivisions are recognized, herein named Mint Spring calcareous marl member and Glendon[14] limestone member. East of Clarke County, Alabama, the middle and lower Vicksburg are similar lithologically and are both included in the Marianna limestone.

[12] MEYER, OTTO, Amer. Journ. Sci., 2d. ser., **30**: 71. 1885.

[13] CASEY, T. L., Philadelphia Acad. Nat. Sci. Proc. **53**: 515. 1901.

[14] The name Glendon limestone has been adopted, with my consent, by O. B. Hopkins (U. S. Geol. Survey Bull. 661-H. 1917) who had access to my notes and manuscripts.

FOREST HILL SAND

The name Forest Hill sand (from Forest Hill, 5½ miles southwest of Jackson, Mississippi) replaces the "Madison sands" of Lowe,[15] which name is preoccupied. The Forest Hill sand appears to rest conformably upon the Yazoo clay member of the Jackson formation. Although the character of the sediments indicates a change from marine to very shallow water or palustrine conditions at the close of Jackson time, it is probable that the change was gradual and that deposition was nearly continuous. The Forest Hill is overlain conformably by the Mint Spring marl member of the Marianna limestone. The relations of the Forest Hill to the Red Bluff clay are not definitely known, but it is believed that the two were formed contemporaneously, the latter having been deposited under more strictly marine conditions than the Forest Hill sand.

In the type area, the Forest Hill sand consists chiefly of cross-bedded or laminated, more or less ferruginous, silicious sand and some clay.[16] West of this area, the formation becomes more argillaceous and contains lenses of lignite and lignitic clay.

In Warren and southern Yazoo counties, the Forest Hill sand is estimated to be about 60 or 70 feet thick, and at Forest Hill it is between 50 and 60 feet thick.

Petrified wood, leaves, and other plant remains are common in the Forest Hill sand, but recognizable forms are not abundant. No animal remains have been found in the formation.

The Forest Hill sand crops out along the bluff from Vicksburg northward to within a few miles of Satartia. Exposures are numerous in eastern Hinds County and in Rankin County as far east as Rankin. Outliers of the Vicksburg group in Madison County afford good exposures of the Forest Hill sand. Southeast of Rankin the country has not been explored in sufficient detail to determine the extent of the formation in that

[15] LOWE, E. N., Op. cit., 82.

[16] A section at Forest Hill School has been published by O. B. Hopkins (U. S. Geol. Survey Bull. 641–D: 100. 1916). I consider the lower 7 beds of his section as typical Forest Hill sand and refer the upper 6 beds to the Marianna limestone.

direction, but lignitic clays that are tentatively referred to the Forest Hill have been observed at a number of places in Smith County.

RED BLUFF CLAY

Fossiliferous deposits on Chickasawhay River at Red Bluff, 1½ miles below Shubuta, were first noted by Harper[17] in 1857. Three years later they were called the Red Bluff group by Hilgard, who correctly announced that their stratigraphic position lies between the Jackson and typical Vicksburg strata and that their fossils are more closely related to those of the Vicksburg than to those of the Jackson.[18]

Wherever the contact of the Red Bluff clay with the underlying Jackson has been observed, the two appear to be conformable. The upper limits of the formation are less well known, but there seems to be no break between it and the Marianna limestone. As the formation has not been traced west of Wayne County, its relations to the Forest Hill sand are conjectural, but it is believed that the two were approximately contemporaneous in origin and that the Red Bluff clay represents the marine equivalent of the exceedingly shallow water deposits of the Forest Hill sand in the Mississippi Embayment. The formation extends eastward into Alabama but rapidly thins, becomes calcareous, and merges laterally into the Marianna limestone.

The Red Bluff consists chiefly of stiff blue or greenish gypseous clay, but contains also discontinuous ledges of indurated marl or sandstone and a thin bed of shell marl. On Buccatunna Creek the formation is 70 feet thick.

The Red Bluff fauna includes more than 128 mollusks, 6 corals, and a considerable number of Bryozoa. Of the 134 species listed from Mississippi, about 60 appear to be restricted to the Red Bluff beds; about 55 are present in the Mint Spring marl or have varieties there; and about 49 species or varieties are known in the Byram marl, of these species 10 have not yet

[17] HARPER, L., Preliminary Report on the Geology and Agriculture of the State of Mississippi, p. 142. 1857.

[18] HILGARD, E. W., Report on the Geology and Agriculture of the State of Mississippi, p. 136. 1860.

been found in the Mint Spring marl. Twelve mollusks, 3 of which range through the Vicksburg group, are listed also from the Jackson formation, but some of these are characterless species of supposedly very long range.

MARIANNA LIMESTONE

The name Marianna limestone was given by Matson and Clapp[19] in 1909 to the soft, porous, light-gray to white limestones at Marianna and other places in western Florida "which are characterized by an abundance of *Orbitoides mantelli* and other Foraminifera associated with many other fossils, prominent among which are *Pecten poulsoni* and *P. perplanus*."[20] The last named species has since been found to be restricted to underlying Eocene strata[21] and was referred to the Marianna limestone by mistake.

The Marianna limestone was included in the Vicksburg group by Matson and Clapp, by whom it was regarded as the stratigraphic equivalent of the upper part of the bluff at Vicksburg (Byram marl). It was later found to lie conformably upon the Ocala limestone,[22] which had been thought to be the highest formation of the Vicksburg group.

The typical Marianna limestone is very homogeneous, white or cream-colored, and when first quarried is so soft that it is easily sawed into building blocks which harden on exposure. Because of its extensive use for building chimneys, it is popularly known as "chimney rock." This facies of the Marianna limestone extends with remarkable uniformity from Marianna, Florida, nearly to Pearl River, Mississippi. It is characterized nearly everywhere by a great profusion of Bryozoa and an abundance of *Lepidocyclina mantelli*, *Pecten poulsoni*, and

[19] MATSON, G. C., and CLAPP, F. G., *A preliminary report on the geology of Florida:* Second Ann. Rept. Florida Geol. Survey, p. 51. 1909.

[20] Idem, 52.

[21] Not having seen the type of *Pecten perplanus*, I am accepting as correct the species so named in the collection of the U. S. National Museum and described by Dr. Dall (*Tertiary Fauna of Florida*, p. 732). Hopkins has figured a specimen on plate 27, in U. S. Geol. Survey Bull. 661-H.

[22] COOKE, C. W., *The age of the Ocala limestone*. U. S. Geol. Survey Prof. Paper 95: 109. 1915.

Clypeaster rogersi. From a thickness of 74 feet at St. Stephens Bluff, Alabama, the "chimney rock" thins to about 45 or 50 feet on Chickasawhay River, Mississippi, and to about 20 feet in the neighborhood of Brandon, Mississippi.

Glendon limestone member. Overlying the "chimney rock" and conformable with it is a series of ledges of hard, partly crystalline, yellowish or pinkish limestone interbedded with softer strata of impure limestone composed largely of Bryozoa, Foraminifera, and shells of *Ostrea vicksburgensis* and *Pecten poulsoni*. This rock is distinguished from the other parts of the Marianna limestone mainly by its lithology, but a few species of organisms are restricted to it. At Glendon, Alabama, it is 18 or 20 feet thick and overlies 20 feet of "chimney rock."

The Glendon limestone extends from McGowans Bridge, Conecuh River, to Mississippi River at Vicksburg. It forms the hard ledges at the top of St. Stephens Bluff and the cap rock of several picturesque waterfalls near Vicksburg. Although it is in few places thicker than 20 feet, the Glendon limestone, because of its hardness, is the most conspicuous part of the Vicksburg group in Mississippi, to which it has given the undeserved reputation of being composed chiefly of limestone.

Mint Spring calcareous marl member. The "chimney rock" facies of the Marianna limestone is replaced in western Mississippi by sands and shell marls for which the name Mint Spring calcareous marl is here proposed. The name is derived from Mint Spring Bayou, a small stream entering Centennial Lake just south of the National Cemetery at Vicksburg. The strata to which the name is applied are exposed beneath a waterfall in the lower course of the stream.

Between Vicksburg and Pearl River the Mint Spring marl occupies the entire interval between the Forest Hill sand and the Glendon limestone, but east of Pearl River, it is overlain by a thickening wedge of the Marianna "chimney rock." It has not been recognized east of Chickasawhay River, on which it is exposed 1¼ miles northwest of the mouth of Limestone Creek. Other important exposures are along Glass Bayou at Vicksburg, and at Haynes Bluff, 14 miles north of Vicksburg, where it is 25 feet thick.

The list of species collected in the Mint Spring marl includes 160 mollusks and 3 corals. Of these, 81 occur also in the Byram marl, about 55 are found at Red Bluff or are represented there by varieties, and about 66 appear to be restricted to the Mint Spring marl.

BYRAM CALCAREOUS MARL

The type exposure of the Byram marl is in the bank of Pearl River at Byram, Hinds County, Mississippi. The Byram beds were supposed by Casey[23] to constitute a "sub-stage" intermediate in age between the Red Bluff clay and the Mint Spring marl, but more detailed study of the fauna shows that the marl at Byram is of the same age as the upper shell bed at Vicksburg. The formation consists chiefly of sandy glauconitic marl, but contains also thin beds of impure limestone, clay, and sand. At Vicksburg it is 42½ feet thick; on Chickasawhay River incomplete exposures indicate a thickness of at least 70 feet, but at intermediate places the exposed parts are much thinner.

Overlying the Glendon limestone at several localities in Alabama are beds of limestone, marl, and clay that appear to represent the Byram marl. Among these localities may be noted Paynes, Salt Mountain, Gainestown, and Choctaw Bluff (which last I have not visited), in Clarke County; Castleberry, Conecuh County, and Yellow River at Watkins-Henderson bridge, Covington County. It is probable that at least part of the exposure at Natural Bridge, Walton County, Florida, represents the same horizon. The upper 60 feet or more of the section at Salt Mountain probably includes the Byram marl, but as the two species of corals in the limestone at the top are found elsewhere in deposits of Chattahoochee age[24] part of the section may be younger than the Byram. The Glendon limestone member and perhaps also part of the underlying "chimney rock" of the Marianna limestone are represented in the lower part of the

[23] Casey, T. L., Philadelphia Acad. Nat. Sci. Proc. **53**: 517–518. 1901.

[24] VAUGHAN, T. W., *Tertiary corals from Central America, Cuba, and Porto Rico.* U. S. Nat. Mus. Bull. 102 (in press).

section, all of which was included in the "Coral limestone" of Smith and Johnson.[25] The Salt Mountain section, which has been considerably disturbed by folding and faulting, deserves more critical study than it has yet received.

The Byram marl is the horizon from which Conrad obtained his typical Vicksburg fossils. The formation contains 6 corals and 136 species of mollusks, of which 81 occur also in the Mint Spring marl, 46 persisted from the Red Bluff clay (including 6 which have not been found in the Mint Spring marl), and 55 which appear to be peculiar to the Byram marl. One of the most widely distributed and abundant species is the little *Scapharca lesueuri* Dall, which appears to be restricted to this horizon. The recent discovery at Vicksburg of a coral which T. W. Vaughan[26] reports from the fossil coral reef at Bainbridge, Georgia, Tampa, Florida, and many places in the West Indies, suggests a closer correlation of the Oligocene chert of Flint River with the Byram marl than has hitherto been suspected.

OUTLINE OF GEOLOGIC HISTORY

The beginning of Jackson time was marked by a northward transgression of the sea which carried the marine fauna of the Moodys marl into areas in which swampy conditions had prevailed during upper Claiborne time. This transgression was most pronounced in the Mississippi Embayment where the marine Jackson fauna extended into Arkansas and where the Jackson flora has been recognized by Berry[27] 135 miles farther north than the northernmost recognized upper Claiborne of this area. The effects of this transgression are noticeable as far east as Alabama River and become prominent again in central Georgia, where marine deposits of Jackson age overlap all older Eocene and Cretaceous strata and rest upon the crystalline rocks of the Piedmont.[28]

[25] SMITH, E. A., and JOHNSON, L. C., Tertiary and Cretaceous Strata of the Tuscaloosa, Tombigbee, and Alabama Rivers. U. S. Geol. Survey Bull. 43: 18–21. 1887.

[26] Op. cit.

[27] BERRY, E. W., *Erosion intervals in the Eocene of the Mississippi Embayment.* U. S. Geol. Survey Prof. Paper 95: 81–82. 1915.

[28] COOKE, C. W., and SHEARER, H. K., *Deposits of Claiborne and Jackson age in Georgia.* U. S. Geol. Survey Prof. Paper 120-C (in press).

In western Mississippi the close of Jackson time was followed by shoaling of the sea, attended by a southward recession of the strand line, in the course of which the lignitic beds and laminated and crossbedded sands of the Forest Hill were deposited. In eastern Mississippi and Alabama, however, the change from Eocene to Oligocene time was not accompanied by changes in physical conditions affecting materially the character of the sediments, for the clay of the upper Jackson and the limestones of the Ocala are succeeded by similar materials in the Red Bluff clay and the Marianna limestone.

While the lignites and crossbedded sands of the Forest Hill were forming in the west and the marine clays and marls of the Red Bluff were being deposited in the intermediate region, the calcareous sediments of the Marianna limestone were accumulating on the Floridian plateau and adjacent parts of Georgia and Alabama. As time went on the phase of deposition producing "chimney rock" progressed westward, and the Marianna limestone overlapped first the Red Bluffs beds and then part of the Mint Spring marl until it had reached the ninetieth meridian. Subsequently, nearly uniform conditions, attending the deposition of the Glendon limestone, prevailed across Mississippi and far into Alabama. Therefore, the Marianna limestone represents a longer time interval in the east, where it includes both the middle and the lower Vicksburg, than in the west, where it is restricted to the middle Vicksburg.

Deposition of the Byram marl appears to have succeeded without interruption that of the Glendon limestone, but the change in character of the sediments indicates a more plentiful supply of mud and sand.

The stratigraphic relations of the Byram marl to the overlying Catahoula sandstone are conjectural. At none of the places where the contact of the two formations has been seen, has any indubitable evidence of unconformity been observed, but at some localities, as near Waynesboro, Mississippi, the change in lithology is so abrupt as to suggest the probability of an interruption in deposition. At other places the transition is so gradual that deposition appears to have been continuous.

BOTANY.—*A new Anemia from Mexico.*[1] WILLIAM R. MAXON, National Museum.

The following new species is one of a number of interesting ferns in a collection received by the U. S. National Museum from Prof. C. Conzatti, of Oaxaca, Mexico, in 1917. At the suggestion of Professor Conzatti it is named as below in honor of his friend and fellow-collector, Dr. Emilio Makrinius.

Anemia makrinii Maxon, sp. nov.

Plants about 50 cm. high; rhizome short-creeping,d ensely clothed with turgid acicular septate dark brown hairs; fronds several, close, distichous, long-stipitate, the sterile and fertile ones nearly alike in size and proportion. Fertile fronds erect, 45–50 cm. long; stipe 25 cm. long, slender, dull stramineous from a dark base, narrowly sulcate laterally and ventrally in the upper part, deciduously blackish-fibrillose; sterile lamina deltoid, 18–25 cm. long, 12–16 cm. broad, acuminate, once pinnate, the rachis stramineous, deeply sulcate ventrally and laterally, glabrate; sterile pinnae 7 or 8 pairs, distant, oblique, straight or mostly falcate, the lowermost the largest, petiolate (4–10 mm.), 6–11 cm. long, 1.4–2 cm. broad, narrowly lance-oblong and long-acuminate or tapering gradually from near the base to a long-attenuate apex, the base subequilateral and broadly cuneate; succeeding pinnae gradually shorter and more oblique, the upper ones free or subsessile, much smaller than the conform or basally lobed terminal segment; costa medial, percurrent, prominent beneath, stramineous, sparsely fibrillose; veins free, very oblique, repeatedly dichotomous, close, prominulous (especially beneath), glabrous; margins faintly cartilaginous, serrate or in the outer part deeply biserrate, the teeth very oblique, nearly straight, flat, acutish; leaf tissue thin-herbaceous, dark green and somewhat iridescent above, paler beneath, glabrous; fertile pinnae ascending, 10–16 cm. long, about half the length of the sterile lamina, the panicle as long as the slender stalk or longer, flattish, 8–15 mm. broad, the lower and middle segments remote, petiolate; spores closely and rather sharply cristate-striate. Sterile fronds similar, but the stipe relatively shorter and the blade more narrowly triangular.

Type in the U. S. National Herbarium, no. 867444, collected at the Cafetal Nueva Esperanza, District of Pochutla, Oaxaca, Mexico, at an altitude of 800 meters, April 9, 1917, by Prof. C. Conzatti, Dr. B. P. Reko, and Dr. Emilio Makrinius (no. 3087). A second collection, received more recently from Dr. Reko, is from the Cafetal Calvario, Oaxaca, altitude 700 meters, September 30, 1917, *Reko* 3365.

[1] Published with the permission of the Secretary of the Smithsonian Institution.

Anemia makrinii belongs to the small group of species with distichous simply pinnate fronds with the basal pinnae fertile, of which *A. speciosa* Presl and *A. mexicana* Klotzsch are the only North American representatives. It resembles *A. speciosa* somewhat in its short fertile pinnae, but differs widely in its more numerous and narrower sterile pinnae, its thin-herbaceous (not rigidly coriaceous) leaf tissue, and in its prominulous veins, the veins of *A. speciosa* being distinctly impressed upon the upper surface. In the character of its leaf tissue it is near *A. mexicana*, but that species is characterized by having the pinnae subcordate-truncate at the base, or exciso-cuneate below, the veins fibrillose-hirtous beneath, and the fertile pinnae erect and invariably surpassing the sterile lamina of the fertile frond. *Anemia makrinii* differs noticeably from both in the flat, nearly straight teeth and only faintly cartilaginous margins of the sterile pinnae, the margins in the two related species being strongly cartilaginous and the teeth stoutish, very rigid, often concave, and curved or, in *A. speciosa*, commonly hamate.

The somewhat iridescent appearance of the upper surface of some of the sterile blades is an interesting character but one probably not of specific importance, as it is variable and tends to disappear. When present it gives the frond a singularly attractive aspect.

ABSTRACTS

Authors of scientific papers are requested to see that abstracts, preferably prepared and signed by themselves, are forwarded promptly to the editors. Each of the scientific bureaus in Washington has a representative authorized to forward such material to this JOURNAL and abstracts of official publications should be transmitted through the representative of the bureau in which they originate. The abstracts should conform in length and general style to those appearing in this issue.

PHYSICS.—*Specific heat of liquid ammonia.* NATHAN S. OSBORNE and MILTON S. VAN DUSEN. Bureau of Standards Scientific Paper No. 313. Pp. 35. 1917.

By use of a calorimeter of the aneroid type specially designed for the peculiar conditions, the specific heat of saturated liquid ammonia has been determined throughout the temperature interval $-45°$ to $+45°$C.

Two distinct and independent methods were used, each of which avoids sources of error present in the other. The greatest difference between the mean results of both methods and the results of either method as represented by empirical equations is less than 1 part in 1000.

As a final result, the specific heat σ in joules per gram per degree centigrade, of liquid ammonia, kept saturated, at the temperature θ, is given in the range $-45°$ to $+45°$C. by the equation

$$\sigma = 3.1365 - 0.00057\,\theta + \frac{16.842}{\sqrt{133 - \theta}}$$

N. S. O.

PHYSICS.—*The latent heat of pressure variation of liquid ammonia.* NATHAN S. OSBORNE and MILTON S. VAN DUSEN. Bureau of Standards Scientific Paper No. 314. Pp. 51. 1917.

When a fluid undergoes a change of pressure, there occurs a transformation of energy into heat or vice versa, which results in a change of temperature of the substance unless a like amount of heat is abstracted or added. This change expressed as the heat so transformed per unit change of pressure will be called "latent heat of pressure variation." For most liquids under usual conditions of temperature and pressure this quantity, which depends on the thermal expansivity, is

small compared with the other quantities of heat which are usually observed, but for liquid ammonia in the range −40 to + 40°C. and corresponding saturated vapor pressures it is sufficiently large to be taken into account in calorimetric determinations of specific heat; and, in consequence, the measurements here described were made as a supplement to a series of such determinations in order to correlate measurements of specific heat of liquid ammonia made at constant pressure with others made under saturation conditions.

The latent heat of pressure variation has been determined in two ways, namely, by direct calorimetric observations and by computation from the expansivity, using for the latter two independent sources of experimental data. Thus, three independent determinations were obtained. N. S. O.

PHYSICS.—*Latent heat of vaporization of ammonia.* NATHAN S. OSBORNE and MILTON S. VAN DUSEN. Bureau of Standards Scientific Paper No. 315. Pp. 33. 1917.

Using a calorimeter of the aneroid type specially designed for the peculiar conditions, the latent heat of vaporization of ammonia has been determined throughout the temperature interval –42 to –52°C.

A detailed description of the design and construction of the instrument has been given in a separate paper.[1] The results of each of 34 determinations agree with the mean result as expressed by means of an empirical equation within one part in 1000. An empirical equation was found that in addition to representing closely the results in the range of temperature covered experimentally also conforms to what is known about the behavior of substances in general when approaching the critical point.

As a final result the latent heat of vaporization of ammonia, that is, the heat required to convert saturated liquid into saturated vapor at constant temperature, in joules per gram, is expressed in the range –42 to –52°C. by the equation:

$$L = 137.91 \sqrt{133 - \theta} - 2.466 (133 - \theta)$$

If the latent heat of vaporization is expressed in calories$_{20}$ per gram, taking 1 calorie$_{20}$ = 4.183 joules, the equation becomes

$$L = 32.968 \sqrt{133 - \theta} - 0.5895 (133 - \theta)$$

Using the results obtained for the latent heat of vaporization of ammonia together with the specific heat of the saturated liquid, the specific heat of the saturated vapor has been computed for various temperatures and given in a table. N. S. O.

[1] Bulletin of the Bureau of Standards **14**: 133; Sci. Paper No. 301. 1917.

CHEMISTRY.—*The iodometric determination of sulfur dioxide and the sulfites.* JOHN B. FERGUSON. Journ. Amer. Chem. Soc. **39**: 364–371. March, 1917.

In this paper are presented and discussed the results of an investigation of the various iodometric methods for the determination of sulfur dioxide and the sulfites. The object of this investigation was threefold: (1) To ascertain the limitations of the existing methods and procedures; (2) to determine the important sources of error; (3) to develop, if necessary, procedures suitable for general application.

Sulfur dioxide. Of the methods considered, the excess iodine is suitable for the analysis of mixtures of either high or low sulfur-dioxide content; the Selby Smelter Commission method is suitable for mixtures of low sulfur-dioxide content; the Reich method gives only approximate results unless large samples are available; and the sulfite method must not be used without a correction factor. Two precautions are essential: (1) The gas sample must not come in contact with even a trace of moisture prior to reaching the absorbent; (2) the analyzing apparatus must be free from rubber connectors if mixtures containing 2 per cent or more of sulfur dioxide are to be analyzed; and rubber connectors would best be eliminated altogether. The excess iodine method is recommended.

Sulfites. In the Treadwell method errors due to the oxidation of the sulfite solution arise from various sources and to eliminate them the following procedure is recommended: The solid salt is dissolved directly in an excess of an iodine solution containing sufficient hydrochloric acid, and the excess iodine determined with thiosulfate.

J. B. F.

CHEMISTRY.—*The ternary system H_2O–K_2SiO_3–SiO_2.* GEORGE W. MOREY (Chemical Study) and C. N. FENNER (Microscopic Study). Journ. Amer. Chem. Soc. **39**: 1173–1229. June, 1917.

The ternary system H_2O–K_2SiO_3–SiO_2 has been studied over the temperature range 200° to over 1000°. The work comprises a determination of the composition and properties of the various stable solid phases which can coexist with solution and vapor within the above temperature range, of the composition of the solutions in equilibrium with the solid phases, of the change in composition of these solutions with temperature, and the approximate determination of the corresponding 3-phase pressures. The chief experimental method used was an adaptation of the "quenching" method so extensively used in the Geophysical Laboratory for the investigation of dry melts.

The following compounds occur: Silica, SiO_2; potassium hydrogen disilicate, $KHSi_2O_5$; potassium disilicate, $K_2Si_2O_5$; potassium disilicate monohydrate, $K_2Si_2O_5.H_2O$; potassium metasilicate, K_2SiO_3; potassium metasilicate hemihydrate, $K_2SiO_3.\frac{1}{2}H_2O$; and potassium metasilicate monohydrate, $K_2SiO_3.H_2O$.

The detailed results of the experiments are summarized in tables and also presented graphically by means of curves and photographs of solid models.

A short discussion of some of the theoretical considerations which govern the equilibrium relations in binary and ternary systems containing a volatile component is given and the proper use of the term "solubility" is discussed. G. W. M.

GEOLOGY.—*Geology of Massachusetts and Rhode Island.* B. K. EMERSON. U. S. Geological Survey Bulletin No. 597. Pp. 289, with maps and illustrations. 1917.

This treatise, which is accompanied by a large geologic map of Massachusetts and Rhode Island embodying the latest information, describes in detail the distribution, character, and relation of the many varieties of sedimentary and igneous rocks exposed in these two States. R. W. STONE.

GEOLOGY.—*Anticlines in the southern part of the Big Horn Basin, Wyoming. A preliminary report on the occurrence of oil.* D. F. HEWETT and C. T. LUPTON. U. S. Geological Survey Bulletin No. 656. Pp. 192, with maps, sections, and illustrations. 1917.

This report gives information regarding 50 domes and anticlines in the south half of the Big Horn Basin, Wyo., and contains many structure contour maps.

The area described embraces some productive oil territory in Wyoming that is undeveloped but very promising. Besides the Greybull, Torchlight, and Grass Creek anticlines, which are already sufficiently developed to contribute largely to the production of oil in Wyoming, there are seven or more domes and anticlines in which oil or gas has been struck, but which are not yet sufficiently drilled to indicate their value as oil reservoirs. Thus 11 of the anticlines here described have already proved to be productive.

The probability that the remaining anticlines and domes described in this resort may contain oil or gas has been carefully considered by

the authors, who have noted their form and prominence, their mutual relations, their positions in the basin, the formations exposed on their axes, and their similarity to like domes and anticlines that carry or do not carry oil or gas. So far as can now be determined from the surface indications, about half of these are considered promising, but the drill, which is the final test, may show that some of them are barren and that others which are now regarded as less promising may be productive. It is highly probable that half or more of the anticlines and domes here described constitute a large part of the most promising undeveloped oil territory in Wyoming. The Big Horn Basin seems to be destined to furnish a large contribution to the Nation's supply of high-grade oil.

R. W. STONE.

GEOLOGY.—*Louisiana clays, including results of tests made in the laboratory of the Bureau of Standards at Pittsburgh.* GEORGE CHARLTON MATSON. U. S. Geological Survey Bulletin 660-E. Pp. 12, with maps and sections. 1917.

This paper shows the geographic and geologic distribution of Louisiana clays and includes 26 tests made by the Bureau of Standards showing the working and burning behavior.

R. W. STONE.

PETROLOGY.—*The problem of the anorthosites.* N. L. BOWEN. Journ. Geol. **25**: 209–243. April–May, 1917.

Anorthosites are made up almost exclusively of the single mineral plagioclase and in virtue of this fact they present a very special problem in petrogenesis. The conception of the mutual solution of minerals of the magma and the lowering of melting temperature consequent thereon is no longer applicable. Yet anorthosites give no evidence of being abnormal in the matter of the temperature to which they have been raised; in other words, they give no evidence of having been raised to the temperature requisite to melt plagioclase. A possible alternative is that they may never have been molten as such and are formed simply by the collection of crystals from a complex melt, probably gabbroic magma. This possibility is in harmony with the expectations that grow out of experimental studies and for this reason a consideration of the likelihood that anorthosites have originated in the stated manner becomes imperative.

A discussion of the method whereby accumulation of plagioclase crystals might take place leads to the conclusion that the most promising method is the separation by gravity of the femic constituents from gabbroic magma while the plagioclase crystals, which are calcic bytownite, remain practically suspended. Then, at a later stage, when the liquid has become distinctly lighter, having attained diorite-syenite composition, the plagioclase crystals, which are now labradorite, accumulate by sinking and give masses of anorthosite, at the same time leaving the liquid out of which they settle of a syenitic or granitic composition.

Some of the consequences of this manner of origin of anorthosite are discussed.

A consideration of anorthosites with special reference to the Adirondack and Morin areas gives some reason for believing that anorthosites show the requisite characters. For the Adirondack area especially, evidence is adduced favoring the possibility that there anorthosite and syenite may still occupy the relative positions in which they were generated by the process outlined, the Adirondack complex being interpreted as a sheetlike mass with syenite above and anorthosite below.

Other monomineral rocks present essentially the same problem and are restricted in their occurrence in substantially the same manner if we consider especially those that approach most closely to the strictly one-mineral character. All of the monomineral rocks do occur, however, as dikes and dike-like masses in essentially contemporaneous, congeneric igneous rocks, a fact which may be interpreted as due to the intrusion of a heterogeneous, partly crystalline mass.

On the whole the inquiry gives considerable support to the belief that the monomineral rocks, of which the anorthosites are perhaps the most important representatives, are generated by the process of collection of crystals under the action of gravity.

N. L. B.

PETROLOGY.—*Adirondack intrusives.* N. L. Bowen. Journ. Geol. **25**: 509–512. Sept.–Oct., 1917.

A reply to criticism by Professor Cushing of certain statements relative to Adirondack structure occurring in the paper abstracted above.

N. L. B.

VOLCANOLOGY.—*Persistence of vents at Stromboli and its bearing on volcanic mechanism.* HENRY S. WASHINGTON. Bull. Geol. Soc. Amer. **28**: 249–278. March, 1917.

In August, 1914, six vents were active on the crater terrace of Stromboli. Examination of plans and illustrations in the literature (many of which are reproduced in the paper) shows that at least three of these vents have persisted in location as far back as 1768. Similarly, at Kilauea the main vent has persisted in location for about a century; and there is evidence of such persistence at some other volcanoes. This feature of volcanoes seems to have been previously unnoticed. Another notable feature of the Stromboli vents is that the oldest three of them open about 1000 meters above sea-level near the upper edge of a precipitous scarp of that height. An analogous situation is true of some of the vents at Etna and also of one or two of those of Kilauea.

In the discussion of these and other features it is shown that such vents can not have originated through explosive agencies; but that their formation, situation, persistence in location, and other features can best be explained by Daly's so-called "gas-fluxing hypothesis," which supposes a "blow-piping" of narrow, vertical vents through the superjacent rocks by hot gases derived from the magma in its reservoir below and kept hot by chemical interreactions. H. S. W.

ORNITHOLOGY.—*The migration of North American birds. 1. Five swallows.* HARRY C. OBERHOLSER. Bird-Lore **19**: 320–330. December 1, 1917.

In this article there are given tables of migration dates for both spring and fall, chiefly from the United States and Canada, of the five following species of swallows, together with the subspecies of each: *Petrochelidon lunifrons* (lege *albifrons*), *Iridoprocne bicolor*, *Tachycineta thalassina*, *Riparia riparia*, and *Stelgidopteryx serripennis*. The data given serve as an index to the migratory movements of these species, and include the average date of spring arrival, the earliest date of spring arrival, the average date of last one observed, and the latest date of last one observed, in autumn as well as in spring, together with a statement of the numbers of years of observation on which the averages are based. H. C. O.

PROCEEDINGS OF THE ACADEMY AND AFFILIATED SOCIETIES

WASHINGTON ACADEMY OF SCIENCES

The meeting of the Board of Managers on March 5, 1918, was devoted principally to the consideration of nominations and the election of new members. Plans for the development of the JOURNAL were discussed, and were referred to a committee consisting of Messrs. KNOPF, HRDLIČKA, and MAXON, to be reported on at a later meeting. The dues of members absent from the United States on military or naval duty were remitted.

Dr. WOODROW WILSON, The White House, Washington, D. C., was elected an honorary member of the ACADEMY in recognition of his contributions to economic and political history.

ROBERT B. SOSMAN, *Corresponding Secretary.*

ANTHROPOLOGICAL SOCIETY OF WASHINGTON

The 520th meeting of the Society was held in the West Study Room of the Public Library, January 29, 1918, at 8 p.m. At this meeting Dr. LEO J. FRACHTENBERG made an address on *Poland and the Polish question.* (No abstract.)

The 521st meeting of the Society was held in the West Study Room of the Public Library, February 12, 1918, at 8 p.m. Dr. JOSEPH DUNN, of the Catholic University of America, was the speaker of the evening and presented an interesting paper on *Scotland.*

"The Scotch reached Scotland from Ireland and are not the descendants of Gaelic Celts who had been pushed north by a later (British) invasion of Britain. The first authentic information on Scotland dates from the time of the Romans, 79 A.D. Roman rule in Britain came to an end in 410, and Britain then ceased to be a part of the Roman Empire. The population of Scotland is made up of Pictish, Irish, British, Saxon, Danish, and Norman elements, all of them Indo-Celtic, the three first, Celtic, the three last, Germanic peoples. The Picts contributed the bulk of the population, but were overcome by the Scotti (Irish), who had settled in Dalriada, a part of the present county of Argyle (Airer-Goidel, 'Margo Scottorum'). The Scotti then became the dominant people. Brythonic Celts dwelt in Strathclyde; their chief city was Dumbarton (Dun Brettan, 'Fort of the Britons'). Towards the close of the eighth century, the Danes appeared and ravaged the coast settlements and the isles. The Saxons first appeared in 428 in Britain. In the eleventh century Norman refugees first crossed the border into Scotland.

"The first Irish colonization in Scotland took place toward the end of the second century, but the kingdom of Dalriada was not effected until the close of the fifth. It is these Scotti who have given their name to Scotland. The relations between the two countries was very close and lasted for a thousand years, or at least up to the Reformation, and the early literature and civilization of Scotland belong to Ireland. The Scottish Gaelic reached its greatest extent in the eleventh century, when the Anglian-Celtic linguistic line ran from Tweed to Solway and to the Pentland Frith. The line has since been receding. Of the three parts into which Scotland is naturally divided, the larger part of the central and all of the northern, with the exception of the northeast part of Caithness, the Orkneys, and the Shetlands, is Gaelic-speaking. The 1911 census showed 202,398 Gaelic speakers in Scotland, of whom 18,400 were monoglots.

"According to legend, the name Scotch is derived from Scota, a daughter of one of the Pharaohs. The word is probably related etymologically to the German Schatz, and means 'masters, owners.' Originally, and therefore in all medieval Latin texts down to the end of the eleventh century, it meant only Ireland. Since that date it means specifically Scotland. The Scotch Gael never calls himself Scotch, but Gael, or, to indicate his country, Albanach. English-speaking Highlanders, even though Scotchmen, are Saxons in the mind of a Gael. In the fifteenth century, when English became the predominant speech in the Lowlands, the English and non-Celtic Scotch called Gaelic 'Erse.' Since the sixteenth century the name Scotch has been applied to the English spoken in the Lowlands. So, by a strange freak of fortune, Scotch, originally applied to a variety of Celtic, has come to mean Broad Scotch or Quaint English, a language of Germanic origin.

"The distinction made between the Highlands and Lowlands of Scotland is correct merely so far as the physical configuration of the country is concerned, but incorrect if a racial significance is read into it. There is a mistaken notion that Scotland is a country of two races, Celtic in the north and Teutonic in the south, and that the latter element has displaced the former. No doubt the Lowland Scotchman is a person of very composite blood, but he is above all a Celt.

"When Scotland was in possession of complete autonomy she enjoyed unrivaled prosperity. She was spoken of on the Continent as 'a nation of heroes,' and the French proverb 'Fier comme un ecossais' is still current. Many treaties of alliance were made with France, and Scottish merchants, traders, and scholars were known all over Europe. The disaster at Culloden (1746) would appear to have crushed Scottish nationality out of existence. The incorporating Union of 1707, 'which was carried by force and fraud' (Prof. William Smith), reduced Scotland to the humiliating level of an appendage of England. Lord Roseberry called Scotland 'the milch cow of the Empire,' and the Marquis of Bute and others have estimated that the dead loss to the country as a result of the Union is from twelve to thirteen million pounds

per annum. As a result of the 'clearances,' the crofters and cotters have had to move to the towns and their places have been taken by rich men who have turned the country into 'sanctuaries' for deer and grouse. The present day Scotch republicans, who represent a party which came into existence at the time of the French Revolution, are now taking steps to see to it that the principle of 'self-determination' is applied to Scotland."

The 522nd meeting of the Society was held in the West Study Room of the Public Library, February 26, 1918, at 8 p.m. On this occasion Dr. PETER ALEXANDER SPEEK, of the Library of Congress, addressed the Society on *The problems of race and nationality in Russia.*

Pointing out the difficulties of a definition of the term "nationality," the lecturer stated that race is a perpendicular division of mankind, a group of people separated according to ethnological and anthropological differences which have resulted mainly from the natural surroundings in prehistoric times, and that nationality is a perpendicular subdivision of a race or races, a group of people with common ways and forms of life, but different from other groups because of histological development under the influence of the different geographical conditions and social forces. Thus nationality may be expressed more or less in everything which is native to a human being and characteristic of his existence, in physical form, in mental and spiritual development, in economics, politics, science, arts, moral principles, customs, and habits.

The speaker described Russia as a conglomerate of a large number of highly varied countries, races, and nationalities united by conquests into one body politic, ruled up to the time of the revolution by the same monarch and the same laws and institutions.

In 1914 the population of Russia was nearly 180,000,000, the race composition of which was as follows: Indo-European, about 80 per cent; Ural-Altaic, 14 per cent; Semitic, 4 per cent; indefinite, about 2 per cent. The statistics of nationality were as follows: Indo-European race—Great Russians, about 44 per cent; Little Russians, 18 per cent; Polish, 6 per cent; White Russians, 5 per cent; German, about 2 per cent; Lithuanians, 1 per cent; Lettonian, 1 per cent; Armenian, 1 per cent—Ural-Altaic race: Turkish-Tartar, 11 per cent; Finnish, 2 per cent; Esthonian, 1 per cent—Semitic race: Jews, 4 per cent—other minor nationalities of the above races, 2 per cent of the whole population. The last Russian census shows that there were 123 different and distinct nationalities living in Russia. The Great Russians, about 44 per cent of the population, ruled all the other subjugated nationalities, i.e., 56 per cent of the whole population.

The policy of the Russian monarchy was to Russianize the non-Great Russian nationalities by violence. This policy is to be explained in part by the teachings of Pan-Slavism. Pan-Germanism and Pan-Slavism sprang from the teachings of the German historians and politicians, who emphasized the fact of the absorption of Slavs by Teutons in northern Prussia and of Finns by Slavs in the northern part of

European Russia centuries ago. Overlooking the fact that this absorption resulted from peaceful intercourse and unconscious assimilation, these German writers began to agitate in favor of Germanizing non-German nationalities by violence. Under the influence of this propaganda appeared Pan-Slavism.

It is believed that the desire to denationalize other nationalities rises from the economic interests of the ruling nationality, or rather of its ruling classes, for the differences in nationality handicap the expansion of trade and business. The results of the efforts to crush weaker nationalities have been negative, as bitterness, hostility, and opposing force have been created. The problem of nationality can not be solved by violence.

There are three philosophical doctrines dealing with the problem: cosmopolitanism, emphasizing the unity of mankind and ignoring nationality, or opposing it; nationalism, ignoring the unity of mankind, believing in the separation of one nationality from another and holding one's own nationality to be the highest, with a special mission in history (Messiahs, Kultur, etc.); and internationalism, holding that all nationalities have equal rights for existence. Self-determination of nationalities is a principle of internationalism. When this principle is realized, the growth of peaceful intercourse and voluntary assimilation of nationalities will be secure,—a step forward in the progress of mankind. FRANCES DENSMORE, *Secretary.*

BIOLOGICAL SOCIETY OF WASHINGTON

The 579th regular meeting was held in the Assembly Hall of the Cosmos Club, Saturday, February 9, 1918; called to order by President ROSE at 8 p.m.; thirty-six persons present.

Under the heading brief notes and exhibition of specimens, A. S. HITCHCOCK referred to the feeding of gulls and pelicans at Tobago as observed by him. The gulls outnumbered the pelicans by 10 to 1 and almost as the pelicans brought up fishes, the alert gulls snatched them away before the pelicans could adjust the fishes for swallowing. This note was discussed by the Chair, L. O. HOWARD, and others.

The regular program was as follows:

S. A. ROHWER: *Notes on the nesting habits of the social wasps.* After stating that the term "social wasps" was restricted to the family Vespidae, Mr. Rohwer told of the recent advances in knowledge of the habits of the Neotropical species by the work of A. Ducke and R. von Ihering. The recent work on the habits suggest that the family may be divided into two sub-families on the shape of the fovea, through which the ligament connecting the gaster with the propodeum passes. These two groups have different habits. In the polygamic forms many of the species swarm, the nest is begun by a number of females and lasts no fixed period. The monogamic forms never swarm, the nest is begun by a single female and is used only a single season. Eighteen slides, arranged to show the development in nest making from the

simple type of *Apoica* to the more complex type of *Polybia*, illustrating nests of the polygamic forms, were shown. Eleven slides showing the nests of the monogamic forms were exhibited. These slides showed the differences between the single comb made by species of *Po'istes* and the more complex nest made by the *Vespae*. Attention was called to the three different types of location used for the nest by the different species of *Vespa*.

Mr. Rohwer's communication was discussed by A. S. HITCHCOCK, L. O. HOWARD, R. W. SHUFELDT, and M. W. LYON. In the discussion the author called attention to the desirability of collecting the smaller types of nests of social wasps and pointed out how they may be collected with safety.

R. W. SHUFELDT: *Biological abnormalities as exemplified by the collection in the Army Medical Museum.* Major Shufeldt illustrated his communication by lantern slides, presenting various forms of so-called "monsters" and other teratologic types, selected from the different branches of the vertebrata including man. All of the specimens shown were chosen from the collection in the Army Medical Museum.

Attention was invited to the occurrence of such deformities in plants, mollusks, insects, crustaceans, and other forms. Various theories were touched upon as to the causes of these departures from the normal animal or plant. Interesting cases, too, of polydactylism, hermaphroditism, diplogenesis, hydrocephalus, cyclops, spiana bifida, terata katydidyma, and numerous other teratologic types were introduced and explained. A somewhat full account was given of the Siamese twins and the lives they led, and other famous united twins were described, and the propriety of the surgical operation to separate them briefly discussed. This interesting field of research was more or less fully entered upon, and a series of illustrated cases, conditions, and the medico-legal questions involved were passed in review.

The 580th regular meeting of the Society was held in the Assembly Hall of the Cosmos Club, Saturday, February 23, 1918; called to order at 8 p.m. by President ROSE; 48 persons present.

Miss M. T. COOKE, Biological Survey, and EDMUND D. GIBSON, Bureau of Entomology, were elected to membership.

The following informal communications were presented:

VERNON BAILEY exhibited and described some newly born examples of the common opossum, and commented on the comparative sizes of newborn and their parents in various mammals.

R. W. SHUFFELDT exhibited and described a young box tortoise with two heads. The individual had lived for a period of nine months in captivity.

C. D. MARSH called attention to the recently issued *Fresh-Water Biology* by Ward and Whipple.

The regular program comprised two communications:

O. W. BARRETT: *A promising new source of sugar.* Mr. Barrett said that the Kaong, or sugar palm (*Arenga saccharifera*) of the Far East, has been used for centuries as a source of syrup and moist sugar, as

well as vinegar, starch, fiber, etc. In 1914 the Bureau of Agriculture at Manila, P. I., worked out a process by which it is possible to produce a fairly light-colored sugar, which crystallizes readily. The opening male inflorescences of the palm are tapped in practically the same way as the coconut and nipa palms are tapped. The fresh sap contains about 15 per cent sucrose, and each flower-branch runs for 8 to 12 weeks. By bringing the fresh sap to about 95°C., then rapidly cooling and treating the liquor above the albuminous precipitate, then treating with lime water until considerably alkalined, then treating with carbon dioxide until another heavy precipitate falls, and finally by boiling the perfectly clear supernatant liquor,—the process is completed. In the Province of Cavite on the Island of Luzon, interesting customs attend the preparation of the inflorescence for tapping, treatment of the raw surface during the flow period, and treatment of the tree afterward. Conservatively reckoned, sugar to the value of $600 to $1000 per acre can be obtained from a moderate stand of Kaong; in other words, without the expense of cultivation, the sugar palm yields a better crop year in and year out for at least twenty years than does the much more popular and better known sugar cane. Vast areas of the sugar palm occur in Indo-China, the Philippines, and Malaya. The trouble heretofore in making a high-grade sugar from the Arenga lay in the large amount of organic impurities in the sap, which with ordinary treatment turn very dark and then tend to reduce the crystallizing power of the sucrose.

Mr. Barrett's paper was discussed by Messrs. A. A. Doolittle, A. S. Hitchcock, and William Palmer.

W. C. Kendall: *Some unrecognized anatomical facts and their relations to fish-cultural practices.* The paper pertained to the peritoneal membranes. Dr. Kendall said that the species of the genera *Oncorhynchus*, *Salmo*, and *Salvelinus* have a certain extent of ventral mesentery, extending from its anterior ventral and intestinal insertions, just back of the base of the ventral fins, to the posterior end of the abdominal cavity. The ovaries of the same species consist of peritoneal folds, each of which is boat-like in form, wi h cross-wise partitions or ovigerous lamellae. In natural position the open or upper surface is inclined inward against the mesovarium so that the ovary is completely enfolded in membrane. A short but varying distance from the posterior end of the abdominal cavity, the dorsal mesentery terminates, leaving a communicating aperture from one side of the abdominal cavity to the other above the intestine for the remainder of its extent. With the termination of the mesentery, the mesovarium also ends. From the posterior end of each ovary, the mesovarium and ovarian membrane continues as a trough-like channel as far as the communicating aperture. Thence the two ovarian membranes, united and attached to the median line of the upper surface of the intestine, form a common trough-like oviducal channel which a short distance from the ovipore diverges to each side and becomes attached to the abdominal lateral walls, thus forming a reduced homologue of the so-called funnel-like oviduct of the smelt as described by Huxley

(Proc. Zool. Soc. Lond., 1883). Contrary to general anatomical and ichthyological statements concerning the reproductive organs of Salmonidae, the ova can not naturally "fall into the abdominal cavity," and, if they in any way gain access to it, they can not be extruded. To those familiar with fish-cultural practices as respects Salmonidae the application of these facts is obvious.

Mr. Kendall's communication was illustrated by lantern slides of the structures described. The paper was discussed by R. W. SHUFELDT.

M. W. LYON, JR., *Recording Secretary.*

BOTANICAL SOCIETY OF WASHINGTON

The 126th regular meeting of the Society was held in the White Parlor of the New Ebbitt Hotel at 8.15 p.m., Tuesday, February 5, 1918. Mr. WALTER T. SWINGLE presided. Fifty-one members and 45 guests were present. Mr. T. H. KEARNEY, the retiring president, delivered an address on *Plant life on saline soils.* (See this JOURNAL **8**: 109. 1918.) Following the address, there was dancing in the Crystal Dining Room.

The 127th regular meeting of the Society was held at the Cosmos Club at 8 p.m., Tuesday, March 5, 1918. There were 50 members and 4 guests present. L. B. SCOTT and SIDNEY F. BLAKE were elected to membership. The following scientific program was given:

D. N. SHOEMAKER: *The American species of the genus Phaseolus* (with lantern). The American species of "beans" cultivated are: (1) *Phaseolus vulgaris*, our common bean; (2) *Phaseolus lunatus*, the Lima bean; (3) *Phaseolus coccineus*, the scarlet runner, and (4) *Phaseolus acutifolius*, var. *latifolius*, the tepary bean.

Phaseolus vulgaris is much richer in varieties than the other species, the number reaching at least one thousand. These do not fall into well-defined groups, and their classification is not readily made. The most obvious division is into true dwarfs, or plants of determinate growth, and trailers, or plants of indeterminate growth.

Phaseolus lunatus is rich in varieties, which may be grouped as: (1) Sieva forms, including the small flat Limas,—a group distinct as to vegetative characters as well; (2) large Limas, which may be further divided into large flat and large round or turgid. All three forms of Lima beans occur with determinate and indeterminate growth.

Phaseolus coccineus, as grown in the United States, does not have a large range of varieties, and may best be classified on color of ripe seeds.

Phaseolus acutifolius has few varieties, which can best be divided on seed color.

The varieties of the first species are each confined in their cultural requirements to definable regions. These regions are roughly as follows: (1) The eastern and northern region, extending from New England to Idaho, and south along the Appalachian Mountains to the Georgia border, White pea, White medium, White Marrow, White Kidney, and Red Kidney being the main types grown here; (2) the Pacific Coast region, mainly in California, the varieties being small California Whites

and Large California Whites; and (3) the southwestern region from western Texas to southern California, and extending into the mountains through Colorado. The varieties here are old native types of beans long cultivated by the Indians, the best known being the Pinto and California Pinks. Besides these there are Bayos, Mexican Reds, and Mexican Whites. This region is the one where production is on the most rapid increase at present, and where expansion can be almost unlimited since beans are grown both as a dry-land crop and under irrigation.

The Lima bean is grown commercially only in the southern part of California along the coast. Scarlet Runner beans are grown only in the northern part of the United States, and then only in gardens.

Tepary beans are better adapted to dry-land farming than are other species. They are fairly salable. They are found growing wild in some of the mountain ranges of southern Arizona, and are a recently discovered part of the aboriginal agriculture of this region.

W. E. Safford: *Economic Phaseoli of the ancient Americans* (with lantern). The origin of the edible species of Phaseolus was for a long time held to be doubtful. Writers on cultivated plants who relied upon the testimony of early explorers and colonists were not convinced that they were all American. The most convincing testimony is that offered by actual specimens from prehistoric graves, burial mounds, and cave dwellings. The writer was fortunate during his explorations in South America in finding excellent specimens of *Phaseolus vulgaris* and *Phaseolus lunatus* from graves on the coast of Peru. During the recent Pan-American Scientific Congress he made an exhibition in the National Museum of the food plants, textiles, aromatic, narcotic, and other economic plants of this continent, which included several distinct varieties of beans. Among them were *Phaseolus vulgaris*, *Phaseolus lunatus*, and *Phaseolus coccineus*. None of the last-named was found in South America; but on the other hand, a number of smooth globose beans called tchui, or chuvi, by the Quichua Indians were taken from graves at Ancon, and it is possible that these may be specifically distinct from *Phaseolus vulgaris*. In one net of a peculiar shape, which may be likened to a three-fingered glove, at least eight varieties of beans were found, including four kinds of "purutus" (*Phaseolus vulgaris*), three kinds of "pallares" (*Phaseolus lunatus*), and the spheroid 'tchuis" already mentioned. In the same net specimens of cotton seed were also found.

Padre Cobo mentions the fact that the round beans called tchui, often beautifully colored, were used by the ancient Quichuas in playing certain games. In Mexico the variously colored beans of *Phaseolus coccineus* were somewhat similarly used by the Aztecs, who called the beans, "ayacotli," or "ayecotli," and the game of chance played with them "patolli." The fleshy root of this bean, called "cimatl," was used by them medicinally. The white variety of *Phaseolus coccineus* "iztacayacotli," now called ayacote blanco or patol blanco, has been frequently mistaken for *Phaseolus lunatus*, and it is one form of this variety which, under the name of "Aztec bean," has been exploited as a discovery in an ancient cave dwelling of our Southwest. As a matter

of fact, it is far inferior to the common *Phaseolus lunatus*, and, though a good snap bean when green, it is scarcely edible when mature.

A few specimens of *Phaseolus lunatus* from Peru are pure white, like the common varieties of our markets; some, however, are mottled like the "pataxte" of Chiapas and the "patani" of the Philippine Islands; others are blackish or maroon colored or yellow and brown and brown particolored. The presence of a number of distinct varieties in a single prehistoric grave indicates that beans had been cultivated in Peru a long time previous to the discovery.

Phaseolus lunatus, the Lima bean, was unknown in North America before the Discovery. When first seen by a certain tribe of Indians they gave it a name signifying, the "bean-that-resembles-the-ground-bean." The ground-bean referred to proved to be *Falcata comosa*, which, in addition to flowers of the ordinary type, yielding small pods enclosing several small seeds, has apetalous flowers on slender creeping basal branches, which bury themselves in the soil and produce solitary seeds resembling Lima beans, usually mottled with purple, but soft and turgid, with an outer skin which never becomes hard, but shrivels on drying. These ground-beans were a food-staple not only of the aboriginal inhabitants of Virginia, but also those of the river valleys of the interior of our country. They are easily gathered and, if cooked when fresh, have a buttery consistency and a pleasant flavor not unlike that of an artichoke.

The lantern slides exhibited included illustrations of *Phaseolus vulgaris* and *Phaseolus lunatus* found in graves with Peruvian mummies and in ancient Indian graves of Argentina and North America; several varieties of *Phaseolus coccineus* ranging from Guatemala to Mexico; and fine large specimens of *Falcata comosa* collected near the Potomac a short distance above Georgetown, together with plants from the normal seeds and from the "ground-beans" referred to, the latter much larger and more vigorous than the former.

David Griffiths: *Illustrations of the conspicuous groups of Opuntia* (with lantern). Doctor Griffiths gave an illustrated talk on the general aspects of the groups of the genus Opuntia, considered in its broadest phases. The slides were selected to show the salient features of the group in the most common representatives both as regards habit and details, they being thrown on the screen mostly in pairs, one showing details and the other habit.

A point of special interest has been revealed in the cultural studies which have extended over a period of ten years, namely, that the Clavateae commonly considered to be naked spined are in reality possessed of spines in scabbards similar to the Cylindropuntia, but the sheaths are early deciduous and consequently not commonly seen in dried specimens. This characteristic of spines in scabbards is distinctly a North American trait and gives a line of cleavage other than a geographical one, the Clavateae being intermediate in this respect between the Cylindropuntia of North America and the Tephrocacti and cylindrical-jointed species of South America.

A few remarks were made upon the food value and the products prepared from the fruits of the genus. Specimens were exhibited of preserved products, still well preserved, made in Mexico by crude processes over ten years ago. Enough of this 10-year-old "queso" was on hand to be sampled by those present. Brief reference was made to "Miel," "Melcocha," and "Colonchi," made from the tuna. Various other economic aspects of the genus were alluded to.

H. N. VINALL, *Corresponding Secretary.*

ENTOMOLOGICAL SOCIETY OF WASHINGTON

The 311th meeting of the Society was held at the Cosmos Club, March 7, 1918; forty members and ten visitors present.

The following names were favorably acted upon for regular membership; R. E. SNODGRASS, JOSEPH D. SMITH, and R. H. VAN ZWALUWENBURG.

The regular program was as follows:

VERNON L. KELLOGG: *Possibilities of entomology in the war.* Dr. Kellogg forcefully set forth the need for increased food production and conservation, especially of cereals, and pointed out the great opportunity for important work along both lines devolving upon entomologists through the control of insects. He stated that the food supply of the world was in a critical condition and it was extremely important that all manner of losses from insect infestation be controlled in so far as possible. The speaker was of the opinion that present conditions offered a splendid opportunity for entomologists to do their part in winning the war and at the same time advance the science in public esteem.

In discussing Dr. Kellogg's remarks, Dr. PIERCE gave some interesting observations regarding the effects of the past winter on the cotton boll weevil. He stated that the unusually low temperatures had given the weevil a very severe set-back and he was of the opinion that the same would be found to be true in the case of other insect pests.

Mr. W. R. WALTON stated that while the early fall frosts and severe low temperatures had perhaps reduced insect infestation, they had at the same time badly damaged the winter wheat, thus causing injury as well as benefit.

Mr. C. L. MARLATT stated that Australian stored wheat had been very badly injured by insects and that the British government had sent an entomologist there who would attempt to disinfect it and save the grain for Allied use. This entomologist had stopped in the United States on his way to Australia for the purpose of studying our methods of dealing with such conditions. Mr. Marlatt also spoke interestingly of food conservation by preventing insect damage to other stored products and growing crops.

N. E. MCINDOO: *Olfactory organs of Diptera.* Illustrated with charts and wax models. (No abstract).

W. S. FISHER: *A new species of Agrilus from Florida.* Read by title.

C. T. GREENE: *Three new species of Diptera.* Read by title.

Under the head of notes and exhibition of specimens Mr. S. A. ROHWER discussed an interesting new genus and species of sawfly which he had recently received from California, where it infests *Libocedrus decurrens.*

A. B. GAHAN, *Recording Secretary.*

SOCIETY OF AMERICAN FORESTERS

An open meeting of the Society of American Foresters (Washington Section) was held Thursday evening, February 14, at the home of Mr. S. T. DANA. Twenty-eight active members and twenty-nine visiting members and guests were present.

Lieutenant-Colonel HENRY S. GRAVES, the speaker of the evening, in an informal talk described the work of the forest regiments in France and outlined his experiences while abroad. The work it seems is entirely behind the lines and has for its purpose the supplying of the American Forces with the timbers, ties, and lumber needed at the front, or in the construction of docks, depots, and permanent camps.

The timber lies, for the most part, in state, communal, or private forests and is acquired through the French Government. Cutting is done under regulations laid down by the Forest Service or private owner, and in the state and communal forests under the direction of the local forest officers.

Following Colonel Graves, Major H. L. BOWLBY outlined briefly the kind of work the Road Battalions of the 20th Engineers (Forest), now nearly recruited, expect to be called on to do.

Following the program, refreshments were served and music was furnished by Mr. WM. C. STUMP, after which the meeting adjourned.

An open meeting of the Washington Section of the Society was held Thursday evening, February 28, at the home of Mr. HERBERT A. SMITH. Eighteen members and nine visiting members and guests were present.

Under the head of announcements and communications, Mr. A. O. WAHA read portions of a letter from Captain A. C. RINGLAND now in France with the 10th Engineers (Forest) describing a recent air raid on Paris.

Mr. A. F. HAWES then introduced the topic for the evening, *Forestry and the fuel problem*, outlining the causes of the recent fuel shortage; what had been done by State Foresters, State Fuel Administrators, and the Forest Service to relieve it by encouraging the cutting, marketing, and consumption of wood in place of coal; and what it was hoped could be accomplished in the future by the wood fuel campaign both to re-

lieve the fuel situation another winter, and to stimulate the practice of private and municipal forestry. It was pointed out that the largely increased demand for wood fuel was both an opportunity for and a danger to the practice of forestry in that while it created a market for forest products not otherwise merchantable, it also might lead to over cutting and to the destruction of potential timber trees.

In the discussion which followed, Messrs. MATTOON, BESLEY (State Forester of Maryland), KROUSZ (recently with the Great Southern Lumber Company of Louisiana), MUNNS, R. C. JONES (State Forester of Virginia), SPARHAWK, E. H. JONES (United States Fuel Administration), BAKER, and HARRIS took part outlining their experiences in the wood fuel campaign and discussing the subject from various angles.

Following the program refreshments were served and the meeting adjourned.

An open meeting of the Society was held Thursday evening, March 14, at the home of Mr. E. H. CLAPP. Nineteen members and twelve visiting members and guests were present.

Under the head of announcements Mr. RAPHAEL ZON reported that at a recent meeting in New York the War Committee was reorganized and Prof. J. W. TOUMEY elected chairman. The purpose of this committee is to keep in touch with the needs of the Government and with the available technical foresters of the country in order that specially trained men can be mobilized for war work as needed.

The topic of the evening, *Forest products and the war*, was introduced by Mr. E. H. CLAPP, who outlined briefly the many and varied uses of wood in the present struggle, and pointed out what an indispensable factor wood is in modern warfare. He also described briefly the war work at the Forest Products Laboratory of the Forest Service, mentioning some of the more important investigations now under way or proposed.

Following Mr. Clapp, Mr. H. S. BETTS discussed certain phases of the work of the Forest Products Laboratory bearing directly on the war, illustrating his remarks by reference to a number of models and drawings. In the work of box testing and testing of woods for various purposes the Laboratory has been especially active. As a result existing specifications have been modified in a number of cases in such a way as to allow the substitution of more available woods and lower grade material without lowering the quality of the product. This has made possible a more complete utilization of available supplies with a consequent saving in cost and reduction in the strain on production. He also stated that new methods of kiln drying lumber have been perfected which make it possible to season material in a few weeks that would ordinarily take several years. This has made possible the speeding up of construction of all kinds where seasoned wood is required. Tests of veneers, glues, and methods of gluing have also been of great value, particularly in airplane construction, while changes recom-

mended in wooden ship specifications have made possible their construction in the East where the large timbers originally called for are not available.

Mr. ROLF THELEN then explained the various types of airplanes and their method of construction. He dwelt particularly on the kinds of wood used and the ways in which wood enters into airplane construction, mentioning some of the difficulties encountered in securing suitable material and how these are being overcome.

During the discussion which followed, Dr. L. F. HAWLEY, Chemist for the Forest Products Laboratory, was called on and spoke of the importance of products derived from wood in the war—acetone, acetate of lime, alcohol, and charcoal being mentioned particularly.

Following the program refreshments were served and the meeting adjourned.

J. A. MITCHELL, *Secretary.*

SCIENTIFIC NOTES AND NEWS

The Chemical Society of Washington, the local section of the American Chemical Society, gave a reception at the Smithsonian Institution on February 28, 1918, to visiting chemists on war duty. The guests were received by Dr. F. B. POWER, President of the local society; Dr. GEORGE P. MERRILL, representing the Secretary and Regents of the Smithsonian Institution; Prof. F. W. CLARKE, of the Geological Survey; Prof. CHARLES L. PARSONS, Secretary of the American Chemical Society; Dr. W. F. HILLEBRAND, of the Bureau of Standards; and Dr. C. O. JOHNS, of the Bureau of Chemistry. Short talks were given later in the evening by Messrs. MERRILL, CLARKE, and PARSONS, and by Major S. J. M. AULD, of the British Mission, Dr. SAMUEL AVERY, of the National Research Council, and Prof. W. D. BANCROFT, of the Bureau of Mines Experiment Station.

About 550 invitations were sent to visiting chemists, while the membership of the local section is over 400. The number of chemists now in Washington is thus in the neighborhood of 1000.

Over two-thirds of the scientific staff of the Geophysical Laboratory are absent from Washington on work connected with the manufacture of optical glass. F. E. WRIGHT is in charge of the optical glass plant of the Bausch & Lomb Optical Co. in Rochester, New York, and is assisted by J. B. FERGUSON and R. H. LOMBARD. C. N. FENNER is in charge at the glass plant of the Spencer Lens Co., near Buffalo, New York, and E. T. ALLEN, E. G. ZIES, and N. L. BOWEN have assisted at different times at this plant. At the request of the Pittsburgh Plate Glass Co. a party under the direction of J. C. HOSTETTER and including L. H. ADAMS, G. W. MOREY, H. S. ROBERTS, and E. D. WILLIAMSON, was sent in December to the optical glass plant of that company at Charleroi, Pennsylvania.

The Geological Society of London has awarded the Wollaston medal to Dr. CHARLES D. WALCOTT, Secretary of the Smithsonian Institution, in recognition of his contributions to geology and Cambrian paleontology. The Wollaston medal was established "to promote researches concerning the mineral structure of the earth and to enable the council of the Geological Society to reward those individuals of any country by whom such researches may hereafter be made." The list of eighty-seven men of science who have received this medal since its establishment in 1831 contains the names of five other Americans who have been so honored—Louis Agassiz, James Hall, James D. Dana, Grove Karl Gilbert, and W. B. Scott. It is an interesting circumstance to note

in connection with the award of this medal to Dr. Walcott that Wollaston, the eminent English chemist who established the medal, was an intimate friend and scientific associate of James Smithson, of London, through whose beneficence the Smithsonian Institution in Washington was founded.

The National Research Council has rented additional space and is now occupying the building at 1015 Sixteenth Street in addition to the offices at 1023 Sixteenth Street. The following four Divisions will be housed in the new offices: (1) Agriculture, Botany, Forestry, Fisheries, and Zoology; (2) Chemistry and Chemical Technology; (3) Geology and Geography; (4) Medicine and Related Sciences.

Dr. H. M. AMI, formerly of the Geological Survey of Canada and now stationed in Washington at the British Embassy, has been elected vice-president of the Société Géologique de France.

A "second general report" by the Permanent Commission of the International Committee in charge of the "Tables Annuelles de Constantes et Données Numériques" has been received. The first volume of these Annual Tables of Constants (covering the year 1910) had appeared, and the volumes for 1911 and 1912 were in preparation at the time of the first report of the commission, which was made to the Eighth International Congress of Applied Chemistry in New York in 1912. The publication of Volume IV, covering 1913, was interrupted by the outbreak of war, and no publication has been possible since that date, although the collection of material has continued under the direction of Dr. CHARLES MARIE, the general secretary, and the following members of the commission: CARRARA (Milan), COHEN (Utrecht), DUTOIT (Lausanne), LEWIS (Liverpool), and STIEGLITZ (Chicago). French, British, and American grants to the Tables have been continued and even increased during the war. The Philosophical Society of Washington and the Chemical Society have been contributing annually to the project.

The following persons have become members of the ACADEMY since the last issue of the JOURNAL: Mr. JAMES PERCY AULT, Department of Terrestrial Magnetism of the Carnegie Institution of Washington, Washington, D. C.; Mr. WILLIAM H. BABCOCK, 802 F Street, Washington, D. C.; Mr. CHARLES RAYMOND DUVALL, Department of Terrestrial Magnetism of the Carnegie Institution of Washington, Washington, D. C.; Mr. JOHN CLYDE HOSTETTER, Geophysical Laboratory of the Carnegie Institution of Washington, Washington, D. C.; Prof. HERBERT SPENCER JENNINGS, Johns Hopkins University, Baltimore, Maryland; Dr. PAUL D. MERICA, Bureau of Standards, Washington, D. C.; Mr. WILLIAM JOHN PETERS, Department of Terrestrial Magnetism of the Carnegie Institution of Washington, Washington, D. C.; Major General HUGH LENOX SCOTT, Headquarters 78th Division, Camp Dix, New Jersey; Mr. BRADSHAW HALL SWALES, Division of Birds,

U. S. National Museum, Washington, D. C.; Prof. RICHARD CHACE TOLMAN, Department of Chemistry, University of Illinois, Urbana, Illinois; Prof. EDWIN BIDWELL WILSON, Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts; Dr. WOODROW WILSON. The White House Washington, D. C.

RESEARCH INFORMATION COMMITTEE

1. By joint action the Secretaries of War and Navy, with the approval of the Council of National Defense, have authorized and approved the organization, through the National Research Council, of a Research Information Committee in Washington with Branch Committees in Paris and London, which are intended to work in close cooperation with the officers of the Military and Naval Intelligence, and whose function shall be the securing, classifying, and disseminating of scientific, technical, and industrial research information, especially relating to war problems, and the interchange of such information between the Allies in Europe and the United States.

2. In Washington the Committee consists of:

(a) A civilian member, representing the National Research Council, Dr. S. W. Stratton, Chairman;

(b) The Chief, Military Intelligence Section;

(c) The Director of Naval Intelligence.

3. The initial organization of the Committee in London is:

(a) The Scientific Attaché, representing the Research Information Committee, Dr. H. A. Bumstead, Attaché;

(b) The Military Attaché, or an officer deputed to act for him;

(c) The Naval Attaché, or an officer deputed to act for him.

4. The initial organization of the Committee in Paris is:

(a) The Scientific Attaché, representing the Research Information Committee, Dr. W. F. Durand, Attaché;

(b) The Military Attaché, or an officer deputed to act for him;

(c) The Naval Attaché, or an officer deputed to act for him.

5. The chief functions of the foreign committees thus organized are intended to be as follows:

(a) The development of contact with all important research laboratories or agencies, governmental or private; the compilation of problems and subjects under investigation; and the collection and compilation of the results attained;

(b) The classification, organization, and preparation of such information for transmission to the Research Information Committee in Washington;

(c) The maintenance of continuous contact with the work of the offices of Military and Naval Attachés in order that all duplication of work or crossing of effort may be avoided, with the consequent waste of time and energy and the confusion resulting from crossed or duplicated effort;

(d) To serve as an immediate auxiliary to the offices of the Military and Naval Attachés in the collection, analysis, and compilation of scientific, technical, and industrial research information.

(e) To serve as an agency at the immediate service of the Commander-in-Chief of the Military or Naval Forces in Europe for the collection and analysis of scientific and technical research information, and as an auxiliary to such direct military and naval agencies as may be in use for the purpose;

(f) To serve as centers of distribution to the American expeditionary forces in France and to the American naval forces in European waters of scientific and technical research information, originating in the United States and transmitted through the Research Information Committee in Washington;

(g) To serve as centers of distribution to our Allies in Europe of scientific, technical, and industrial research information originating in the United States and transmitted through the Research Information Committee in Washington;

(h) The maintenance of the necessary contact between the offices in Paris and London in order that provision may be made for the direct and prompt interchange of important scientific and technical information;

(i) To aid research workers, or collectors of scientific, technical, and industrial information from the United States when properly accredited from the Research Information Committee in Washington, in best achieving their several and particular purposes.

6. The headquarters of the Research Information Committee in Washington is in the offices of the National Research Council, 1023 Sixteenth Street; the Branch Committees are located at the American Embassies in London and Paris.